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I, LEANNE MYNOTT, MANAGER EXAMINATION SUPPORT AND
SALES hereby certify that annexed is a true copy of the Provisional specification
in connection with Application No. 2003904535 for a patent by BUILDING
SOLUTIONS PTY LTD as filed on 25 August 2003.

WITNESS my hand this
Second day of September 2004



A handwritten signature, appearing to be "LM", written in ink.

LEANNE MYNOTT
MANAGER EXAMINATION SUPPORT
AND SALES

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AUSTRALIA

Patents Act 1990

PROVISIONAL SPECIFICATION

Invention Title: "BUILDING PANELS"

The invention is described in the following statement:

TITLE: BUILDING PANELS

BACKGROUND OF THE INVENTION

1. Field of the Invention

THIS INVENTION relates to building panels.

5 The invention also relates to buildings and building systems employing the panels.

The invention particularly relates, but is not limited to, hollow building panels which can be filled with concrete to meet structural strength, thermal-barrier and acoustic-barrier standards, and to buildings and building
10 systems employing such panels.

2. Prior Art

Many factory form panels are used in the building industry to form walls, roofs, etc for buildings, which are required to meet specific strength, thermal-barrier and acoustic-barrier standards. Examples of
15 commercially successful panels are disclosed in AU-B-26656/92 (671957) and AU-B-59414/96 (694048), both in the name of Building Solutions Pty Ltd.

While such panels have proven successful, they can always be improved. For example, the need for joiner panels required inventory of two
20 panels for a given height/width/thickness combination. In addition, the panels could not be easily varied in thickness; could not employ waste materials in their construction; and could not be manufactured from a minimum number of basic components.

SUMMARY OF THE PRESENT INVENTION

It is an object of the present invention to provide a building panel which can be manufactured in a range of heights, widths and/or thicknesses from a minimum number of different components.

5 It is a preferred object to provide such a panel which has no thermal bridging, for improved thermal-barrier characteristics.

It is a still further preferred object to provide a panel which minimises corrosion by separating dissimilar metals.

10 It is a still further preferred object to provide a panel which uses off-cuts from the facing sheets and for spacer elements in the panel to minimise waste.

It is a still further preferred object to provide panels which enable simplified stock ordering/reduced material inventories/simplified erection in building systems employing the panels.

15 Other preferred objects will become apparent from the following description.

In one aspect, the present invention resides in a building panel for use in the construction of walls and the like, including:

spaced apart first and second facing sheets;

20 at least two pairs of studs, one stud of each pair being fixed to an inner face of one of the first and second facing sheets and aligned with the other stud of the pair fixed to an inner face of the other of the first and second facing sheets; and

at least one spacer element interconnecting the one and other studs of each pair;

arranged that voids in the panel are adapted to be filled with concrete and/or structural building elements.

5 Preferably the facing sheets are formed of fire resistant, or fire retardant materials, such as MDF, HDF, fibre-cement sheeting, aluminium sheeting, plastic sheeting or the like. Facing sheets may have a pre-finished outer face, or be adapted to be coated eg. by paint, plaster or other suitable coatings or finishes.

10 Preferably the pairs of studs are provided at modular distances of n or $2n$ (where n is typically 82 mm). (The actual spacing can be varied to suit a particular intended installation.)

 Preferably the studs are of modular length eg. nx millimetres (where x is typically 100 mm).

15 Preferably the studs are terminated 0-100 mm, more preferably 0-50 mm from the bottom of the facing sheets, and 0-200 mm, more preferably 100-200 mm from the top of the facing sheets.

 Preferably the studs are bonded to the facing sheets by suitable adhesives, but may be fixed by fasteners or other suitable fixing means.

20 Preferably the studs are extruded from aluminium, plastics material (including fibre-reinforced plastic materials) or other suitable materials.

 Preferably the spacer elements are thermally insulating to counter thermal bridging in the panel.

 Preferably the spacer elements are formed from off-cuts of the

facing sheet material.

Preferably the spacer elements are $m \times$ mm long (where x is typically 100 mm) and are spaced $n \times$ mm apart (where x is typically 100 mm).

- 5 Preferably vertical and/or horizontal reinforcing elements eg. reinforcing bars, can be inserted into, and extend from, the floors before the panels are filled with concrete.

- 10 Preferably a pair of end elements, having a channel to receive a bottom or top edge of a facing sheet, are provided along the top and bottom of the panels to enable the panel to be fixed to panels, or other building structure(s) above and below it.

Preferably a pair of end elements are provided along the side of the panel for fixing to a similar panel at a junction.

- 15 Preferably joiner elements, preferably the same material as the studs, and preferably of modular length of $n \times$ mm (where x is typically 100mm) interconnect the adjacent studs of the adjacent panels together.

Preferably a top plate or bottom plate interconnects the end elements at the top, and bottom, of the panel, respectively, to restrain the facing sheets from bowing or deforming.

- 20 Preferably internal and external corners interconnect the respective facing sheets of adjacent panels at the corner.

In the second aspect the present invention resides in a building system employing the panels hereinbefore described, the building system providing a building structure which meets/exceeds low strength, thermal-

barrier and/or acoustic-barrier standards.

In third and fourth aspects, respectively, the present invention resides in a building structure incorporating the panels of the first aspect and constructed employing the building system of the second aspect.

5 Other aspects of the present invention relating to components of the building system will become apparent from the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

To enable the invention to be fully understood, preferred embodiments will now be described with reference to the accompanying
10 drawings, in which:

FIG. 1 is a typical sectional end view of walls and a floor using the panels of the present invention;

FIG. 2 is a top sectional view of a number of walls constructed using the panels;

15 FIG. 3 is a top sectional view of a construction joint between adjacent panels;

FIGS. 4 and 5 are respective side and top sectional views of a window installation in one of the panels;

FIG. 6 is a top plan view of the range of panels;

20 FIGS. 7(a) to (c) are respective views of a stud to the panels;

FIGS 8(a) to (c) are respective views of a joiner element for joining the panels;

FIGS. 9(a) to (c) are respective views of an external corner;

FIGS. 10(a) to (c) are respective views of an inner corner;

FIGS. 11 (a) to (c) are respective views of a top plate or bottom plate;

FIGS. 12 (a) to (c) are respective views of a top or bottom end element;

5 FIGS. 13(a) to (c) are similar views of a bottom end alloy with a lip; and

FIGS. 14(a) to (c) are respective views of an edge form rebate.

DETAILED DESCRIPTION OF THE INVENTION

10 As shown in FIGS. 1, 2 and 6, each panel 10 has a pair of facing sheets 11, 12, typically 6.0 mm thick, of suitable material (eg. fibre-cement), which is preferably fire resistant, or at least fire retardant.

The facing sheets are 11, 12 cut to the desired height of panel 10 (eg. 2.4 – 3.0m) and to the desired width (eg. in the range 132 to 1200 mm as shown in FIG. 6).

15 As shown in FIG. 6, and as will be discussed in more detail hereinafter, the facing sheets 11, 12 are separated by a pair of opposed, aligned, studs 20, interconnected by one or more space elements 30.

Preferably the studs 20 are spaced at modular intervals of n or $2n$, wherein $n = 82$ mm in the example shown in FIG. 6.

20 Preferably in the panels of 132 mm and 215 mm width, the spacing of the studs is at the n modular spacing. For the panels of 214 mm, 379 mm, 543 mm, 707 mm, 831 mm, 1036 mm and 1200 mm width, the spacing of the studs is at $2n$ modular spacing. For the remaining panels, the pairs of studs 20 at the sides are at n modular spacing and the intermediate

pairs of studs 20 are at $2n$ modular spacing (eg. 540 mm panel has studs 20 at $n/2n/2n/n$ modular spacings).

As shown in FIGS. 1 to 5, and more particularly FIGS. 7(a) to (c), the studs 20 are of a modified "T- shape" end view. The studs 20 are preferably extruded in aluminium (or other suitable metal), plastic material (including fibre-reinforced plastics) or any other suitable material.

Each stud 20 has a head 21 adapted to be bonded (by adhesives) and/or fastened (by rivets, screws, other suitable fasteners) to the inner face of its associated facing sheet 11, 12. A "bifurcated leg" to the T-shape is provided by a pair of flanges 22, 23 formed integrally with the head 21 and having out-turned "leading" lips 24, 25. Flanges 22, 23 having removably directed teeth 26 adapted to spacer elements 34.

The studs 20 preferably terminate 50-100 mm above the bottom edge of the facing sheets 11, 12 and 100-300 mm below the top edges of the facing sheets 11, 12. (Preferably the studs are multiples of 100mm in length.)

As the heads 21 of the outer studs 20 extend to the side edges of the facing sheets 11, 12, the side edges are protected against damage during manufacturing, transportation and erection of the panels 10.

Preferably the spacer elements 30 are off-cuts from the material sheets from which the facing sheets 11, 12 are cut. As shown in FIG. 1, they are preferably 100 mm (or a multiple thereof) long and are spaced apart, preferably at multiples of 100 mm to allow structural reinforcing steel to be passed therebetween and to also allow concrete to flow between

the vertical cavities in the panels separated by the space elements 30.

As shown in FIGS. 1 and 2, vertical starter bars SB can extend into the vertical cavities in the panels 10.

5 End elements 40, shown in more detail in FIGS. 12(a) to (c) are provided along the top and bottom edge of the facing sheet 11, 12. The end elements 40 have face flanges 41, 42 joined by a web 43 to form a channel 44 operable to receive the edge of a facing sheet 11, 12. A web 45 extends from flange 41 and has an L-shape flange 46; the flange 41, web 45 and L-shape flange 46 forming a channel 47 to receive one end of a top or bottom
10 plate 50.

Referring to FIGS. 11(a) to (c), each top or bottom plate 50 has a substantially planar body 51 with down turned lip flanges 52, 53 along the sides of the body 51. Flanges 54, 55 extend perpendicularly from the body, and as shown in FIG. 1, the flanges 54, 55 are adaptably engaged in the
15 channels 47 of the end elements 40.

Preferably the top and bottom plates are extruded from aluminium, as are the end elements 40; but while the end elements 40 extend the full length of the facing sheets 11, 12, the top and bottom plates 50 are preferably cut to modular lengths eg. 100 mm or multiples thereof.

20 As shown in FIGS. 4 and 5, end elements 40 surround the hole cut in the facing sheets 11, 12 for the provision of a window assembly 60. The lower frame member 61 of the window assembly 60 is fixed to a bottom plate 50 extending along the window sill 62. The remaining side and top frame members 63, 64, 65 are fixed to the infill members 13, cut from the

facing sheet material, and received in channels 48 defined by web 45 and L-shape flange 46 in end members 40. It will be noted that screws 49 anchor the end members 40 to the facing sheets 11, 12.

As shown in FIG. 3, the end members 40 support infill members 13 down the sides of the panels 10 at a construction joint 70, where screws 49 each pass through a facing sheet 11, 12, flange 41 of an end element 40 and head 21 of stud 20. Fire-rated sealant 71, with a back-up rod 72, is interposed between the adjacent pairs of end elements 40 to provide a fire-resistant seal between two panels 10 at the construction joint 70.

As shown in FIG. 2, joiner element 80, shown in more detail in FIGS. 8(a) to (c) is used to adjoin to adjacent panels 10 together. The joiner element 80 is substantially L-shaped, with a body 81 and flange 82 with lip 83. Preferably the joiner 80 is extruded from aluminium and may be cut to modular lengths of 100 mm or multiples thereof.

As shown in FIG. 2, the flange 80 is nested against one of the flanges 22, 23 of a stud 20 and the body 81 overlies the heads 21 of adjacent studs 20 of adjacent panels 10. Screws 49 are driven through the facing sheets 11 or 12, heads 21 of the studs 20 and the body 81 of the joiner element to connect the panels together.

At a typical corner, illustrated at the lower left corner of FIG. 2, the adjacent facing sheets 11, 12 of the panels 10 are connected by an inner corner 90 shown in more detail in FIGS. 10 (a) to (c). The inner corner 90 is of substantially "w-shape", with webs 91, 92 at right angles and terminated by

flanges 93, 94 with lips 95, 96.

The webs 91, 92 overlie the heads 21 of the adjacent studs 20 and the flanges 93, 94 are nested with the flanges 22, 23 thereof.

5 Screws 49 pass through the facing sheets 11 or 12, heads 21 of the studs 20 and the webs 91 or 92 of the internal corners 90 to secure the panels together.

10 After the horizontal reinforcing elements have been inserted into the panels 10 (through the spaces between the spacer elements 30) and tied together, an external corner 100, shown in more detail in FIGS. 9(a) to (c) is located to enclose the corner.

The external corner 100, extruded from aluminium or plastics material like the inner corner 90, has webs 101, 102 at eg. 90°/92° included angle. Each web 101, 102 is terminated by a flange 103, web 104 and lip flange 105.

15 The external corner 100 is either inserted vertically, or one side is engaged with one panel 10 and other side is "sprung" into position with the second panel 10.

20 It will be noted that each web 104 overlies a head 21 of a stud 20 and the lip flange 105 is nested with the flange 22, 23 of a stud 20. A screw 49 passes through the facing sheet 11 or 12, head 21 of the stud 20 and web 104 of the external corner to secure the components together.

The external corner 100 provides an accurate joint line against which a plasterer can finish the corner.

At a typical squint corner, shown at the lower right hand of FIG.

2, the right-angled internal corner 90 and external corner 100 are replaced by purpose made internal and external corners 90A, 100A of the desired internal angle eg. $112.5^{\circ}/120^{\circ}/135^{\circ}/150^{\circ}$.

At an internal junction between two panels 10, shown in FIG. 2,
5 a top or bottom plate 50 is provided down one side of the panel 10 (forming the "leg" of the T-junction), the top or bottom plate 50 being received in channels 47 in end elements 40. Screws 49 fix the top or bottom plate 50 to the facing sheet 11 or 12 of the adjacent panel 10.

FIG. 1 illustrates a typical building system for multi-storey
10 building construction, where superimposed panels 10 are connected to a concrete floor slab 120. It will be noted that starter bars SB interconnect the upper- and lower- storey panels 10 and pass through the bond beam 121 at the edge of the floor slab 120. (A bond beam 122 interconnects the upper ends of the upper-storey panels 10, extending along the panels 10 above the
15 upper ends of the studs 20).

A bottom element 40A, shown in more detail in FIGS. 13 (a) to (c), is provided along the outer lower edge of the upper-storey panel 10 and it will be noted that flange 42A has an extension or lip 42B which extends over a recess or "shadow line" 123 in the concrete slab 120 below the
20 junction with the upper-storey panel 10.

The top edge of the outer facing sheet 11 or 12 of the lower-storey panel 10 is provided with an edge form rebate 130, shown in more detail in FIGS. 14(a) to (c).

The edge form rebate 130 has flanges 131, 132 connected by

a web 133 to form a channel 134 to receive the facing sheet 11, 12 of the lower-storey panel 10. Flange 135 connects web 133 to a web 136 with a lip 137. You will note that web 136 engages, and may be fixed to, a bottom plate 50 of the upper-storey panel 10. The bottom plate 50 is fixed by at least one correct concrete fixing screw 49A to the concrete floor slab 120.

It will be readily apparent to the skilled addressee that respective profiles of the studs 20, end elements 40, joiner elements 80, internal corners 90, bottom elements 40A and edge form rebates 130 are common to all panel heights/widths/thicknesses. This means that these components can all be extruded and cut to length as required.

Spacer elements 30 can be cut from the waste of the (eg. fibre-cement) sheets from which the facing panels 11, 12 are cut, to enable the panels to be of the desired final thickness (eg. 115 mm/135 mm/150 mm/200 mm).

Respective top and bottom plates 50 and external corners 100 are required for each panel thickness, but these can be extruded and cut to length as required.

It will, however, be readily apparent to the skilled addressee that the number of different components required to manufacture a wide range of panel heights/widths/thicknesses can be markedly reduced to simplify inventory management, reduce inventory holding costs, and enable computer-aided designs/ordering/manufacture of the panels for a particular building installation.

The panels 10 and associated components are designed for

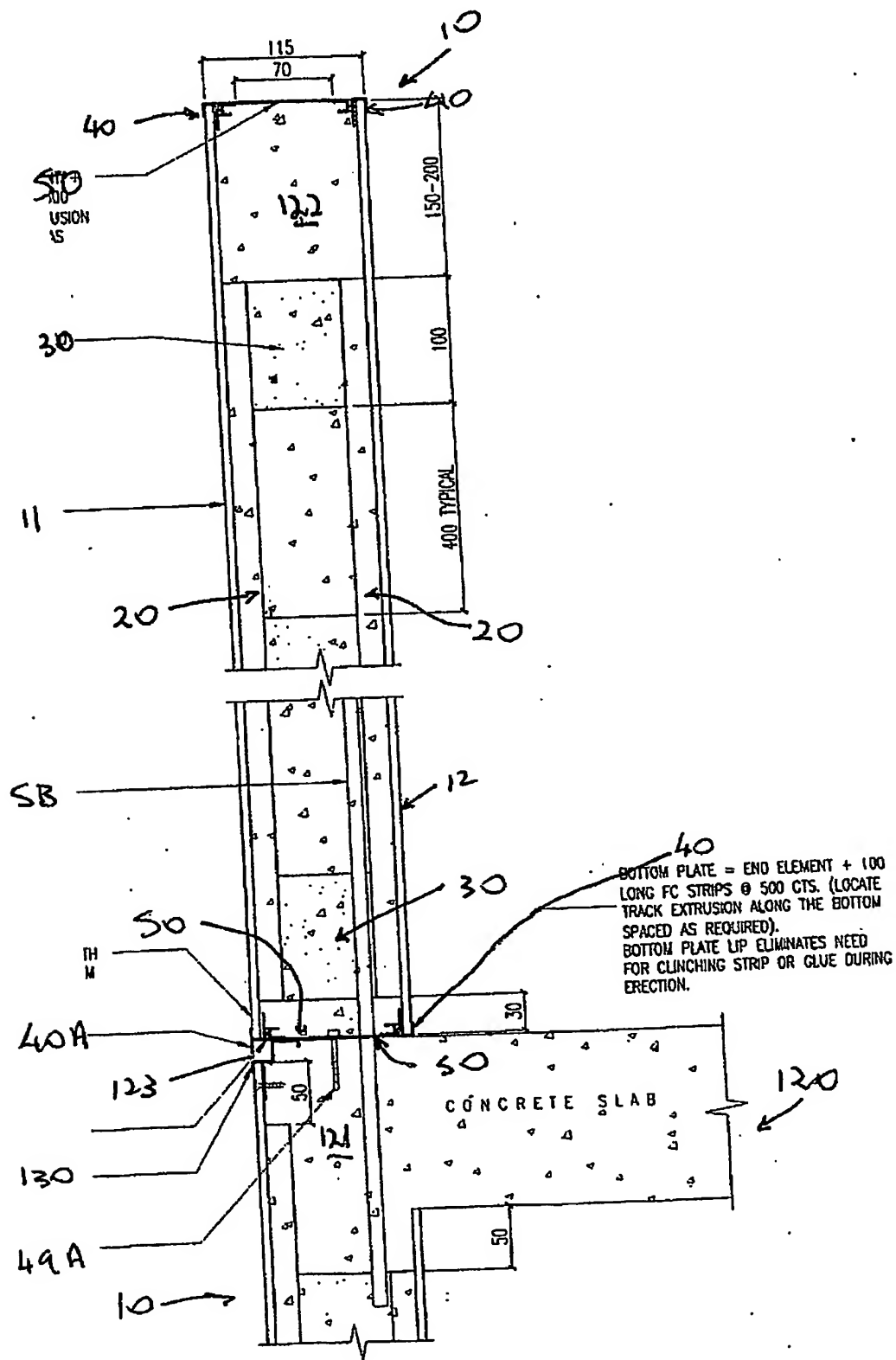
easier erection and installation of the building reinforcing elements and the concrete; while ensuring all relevant standards are met.

5 The end elements 40, top and bottom plates 50, and the ability to provide a "shadow line" joint, ensure accurate/aesthetic connection between adjacent panels 10 (and eg. floor slabs 120).

In addition, the end elements 40 and external corners 100 provide accurate guides for plasterers applying finishes to the facing sheets 11, 12.

10 Various changes or modifications may be made to the embodiments described and illustrated without departing from the present invention. Any measurements indicated on the drawings are by way of illustration only and not limiting to the present invention.

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TYPICAL PANEL SECTION

FIG. 1

2/12

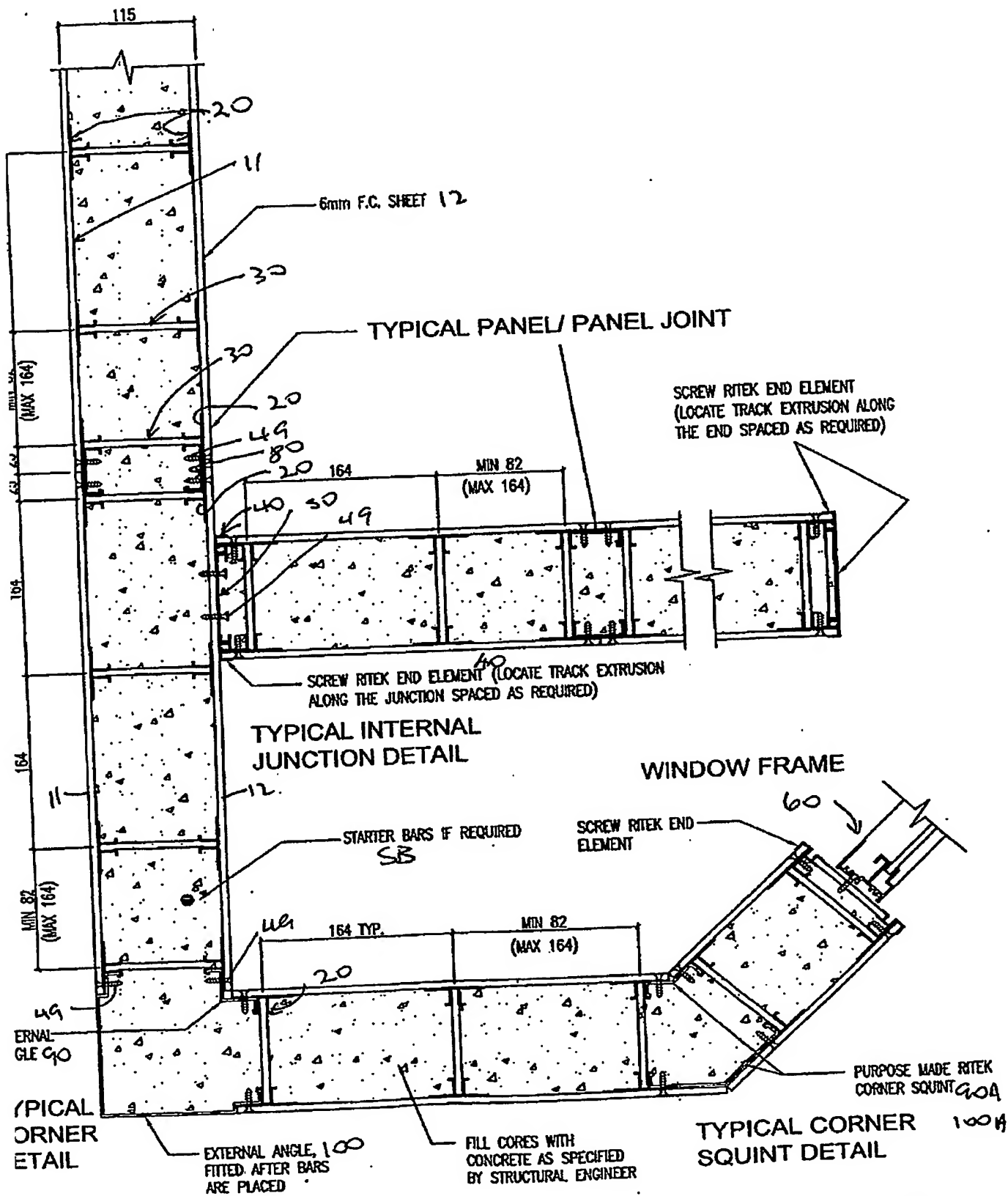
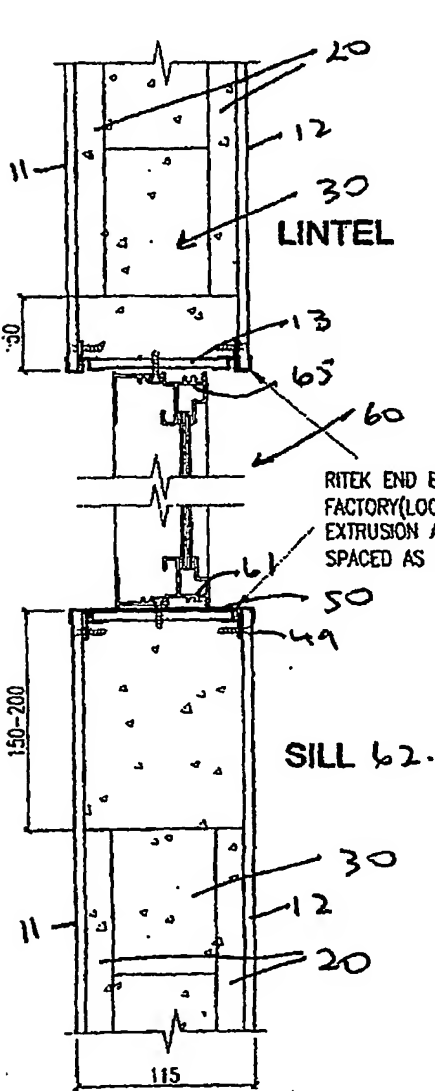


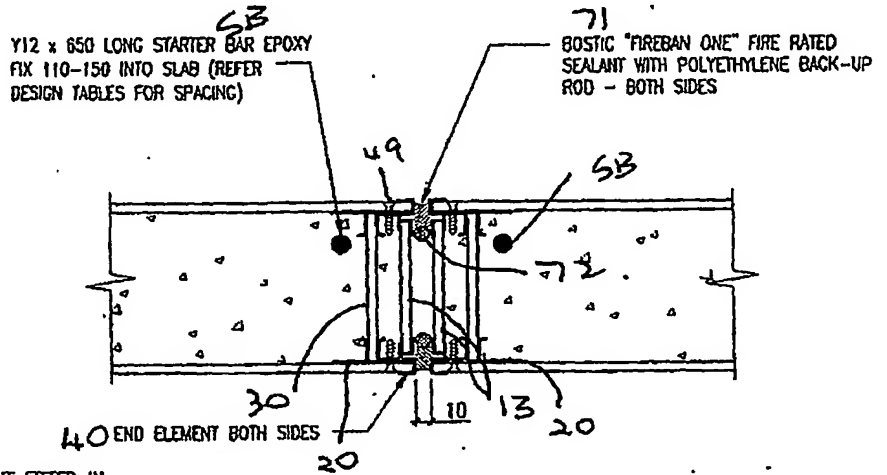
FIG 2

312



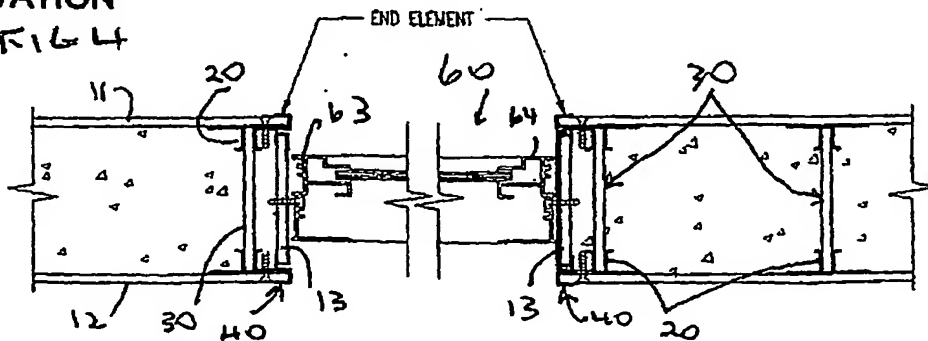
WINDOW ELEVATION
DETAIL

FIG 4



TYPICAL CONSTRUCTION JOINT 70

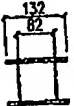
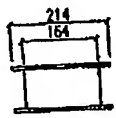
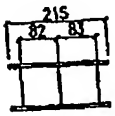
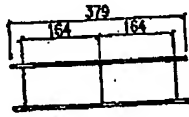

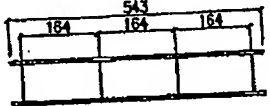
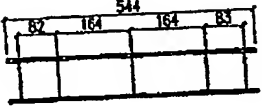
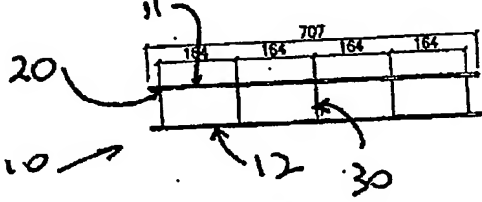
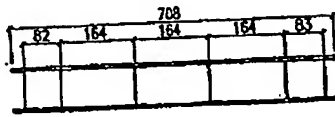
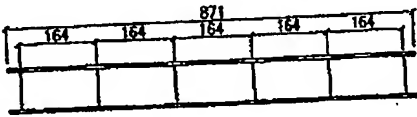
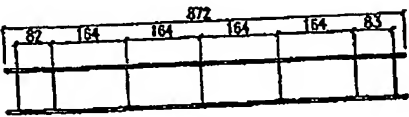
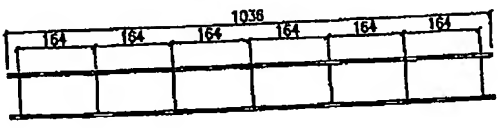
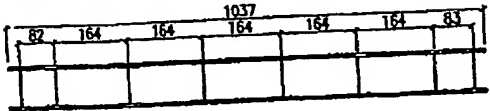
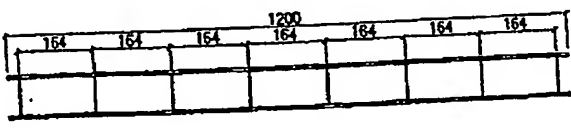
FIG 3



WINDOW PLAN DETAIL

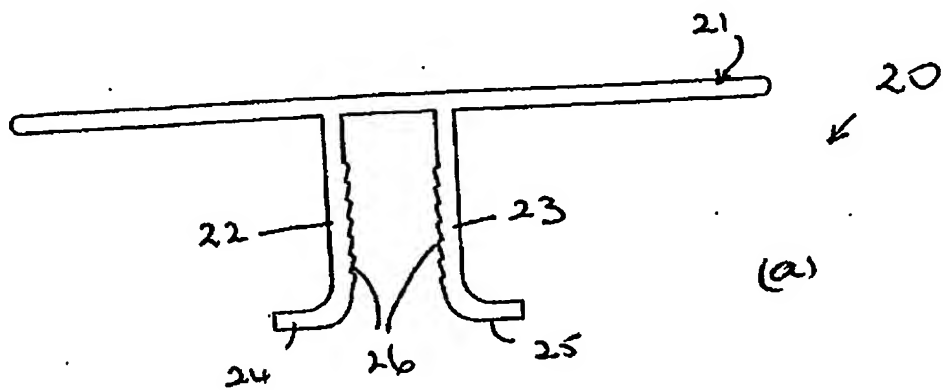
FIG 5

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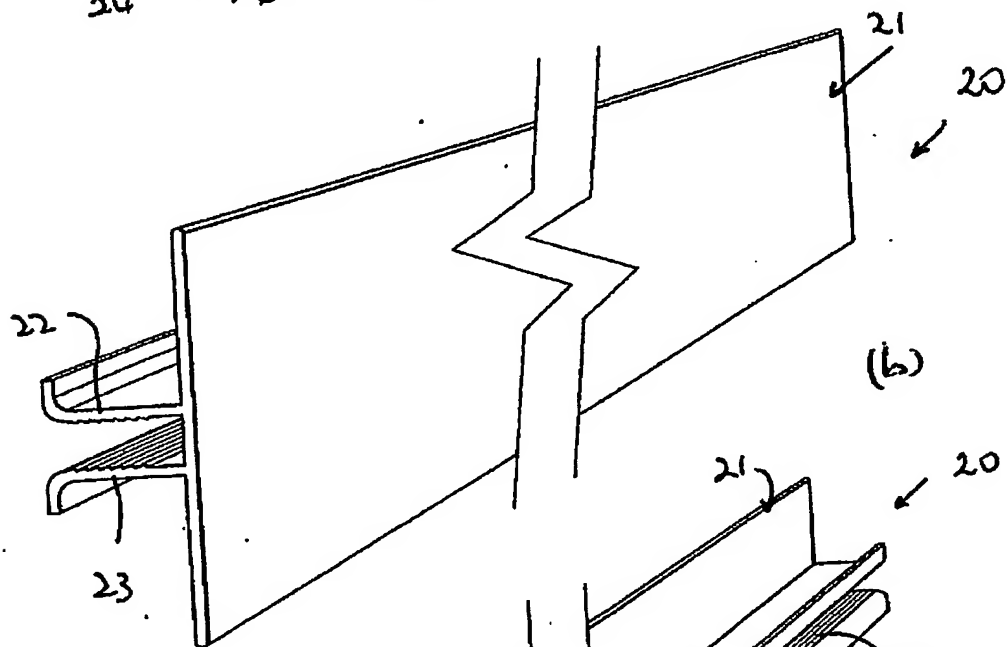
MIN WIDTH	No OF STUDS	MAX WIDTH
	2	 214
	3	 379
	4	 543
	5	 707
	6	 871
	7	 1036
	8	 1200

PANEL FRAME SIZES FIG 6

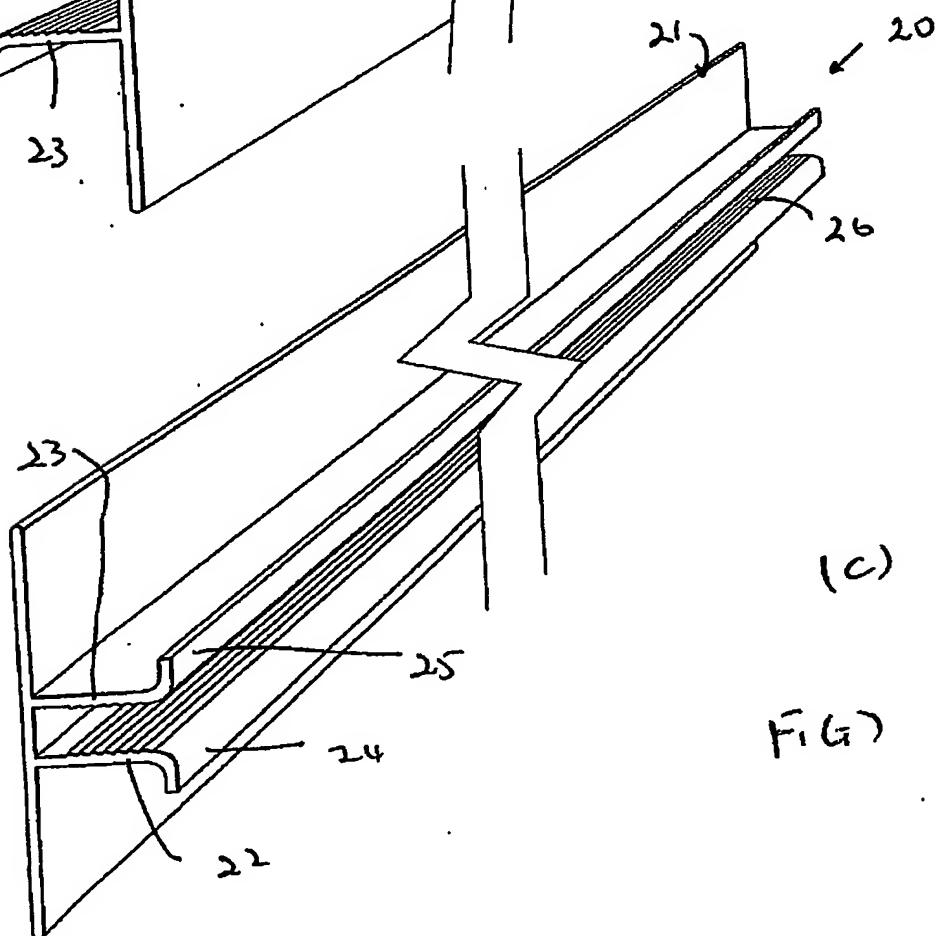
5112



(a)



(b)



(c)

FIG)

6/12

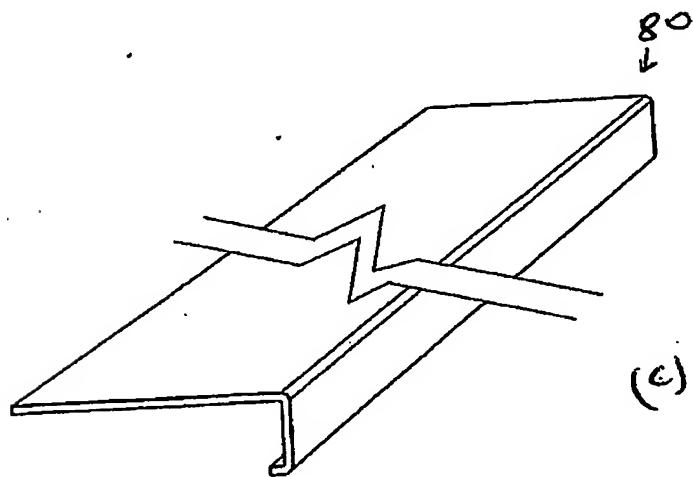
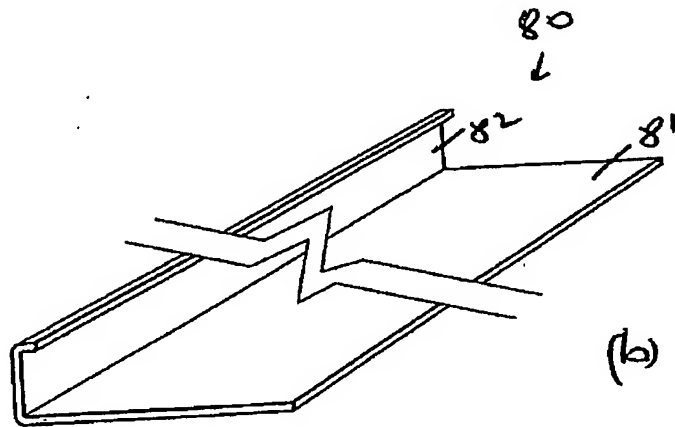
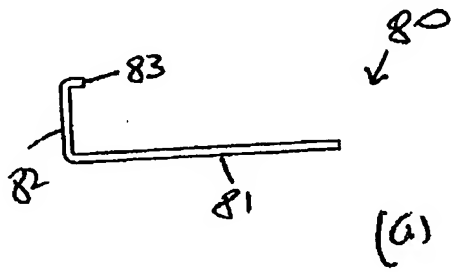
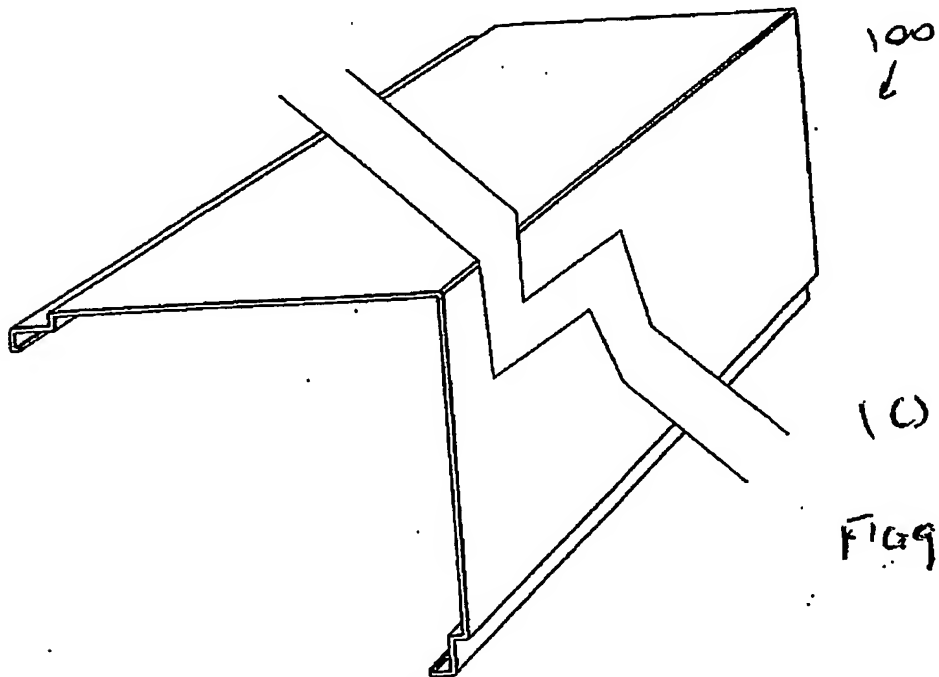
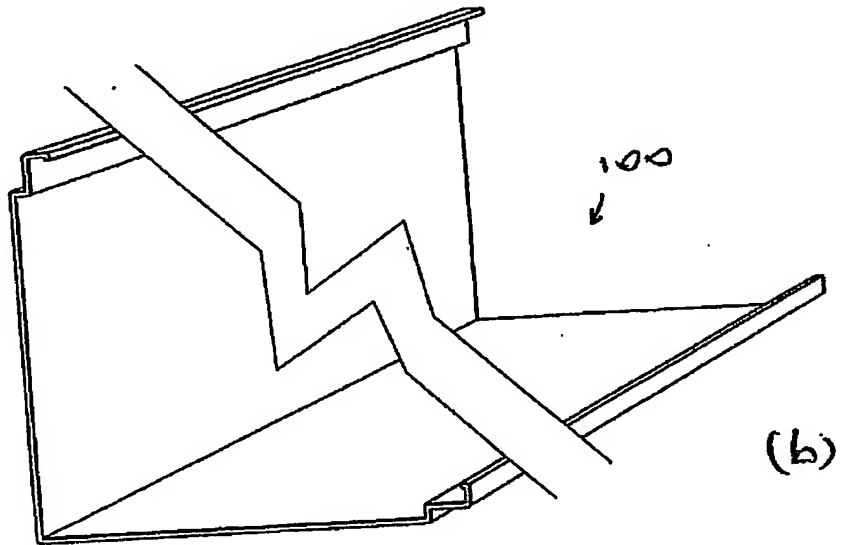
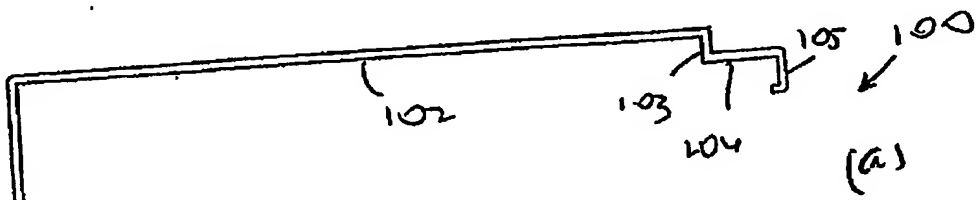


FIG. 8

7/12



Flag

8/12

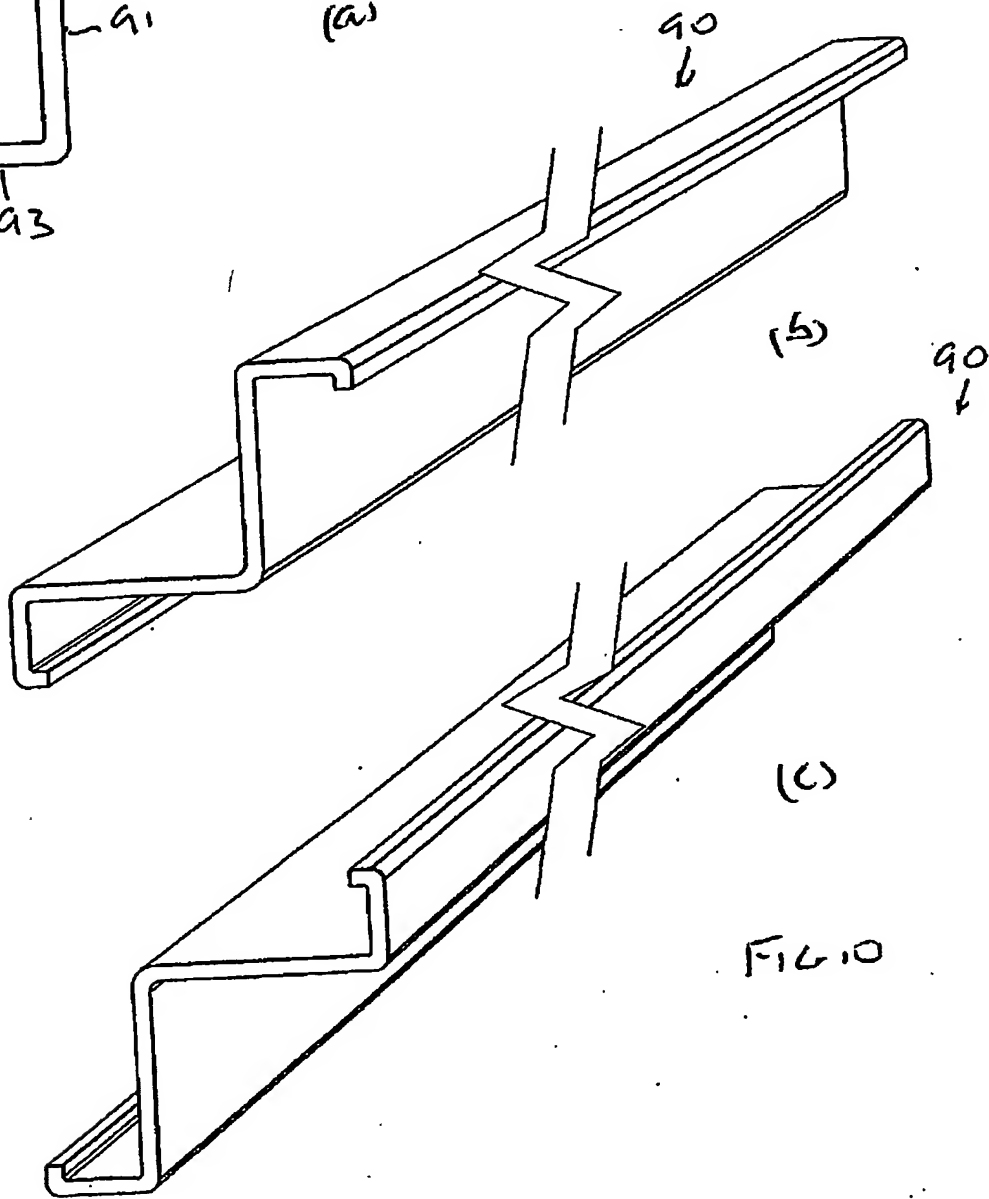
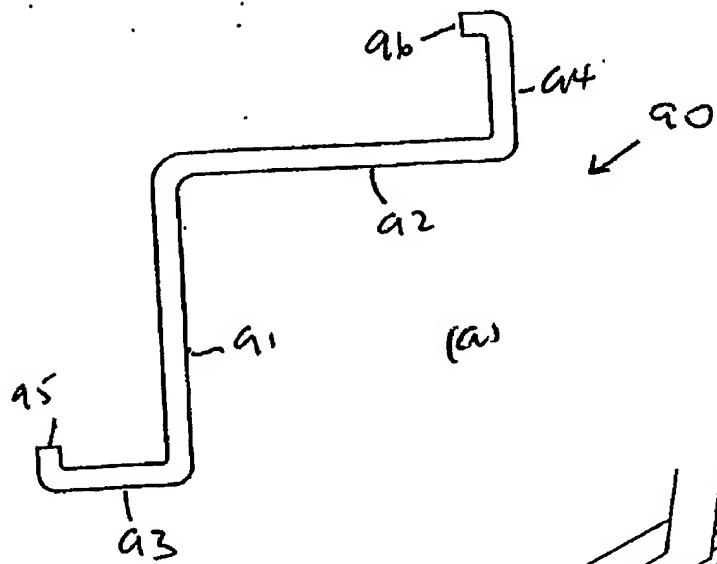


FIG 10

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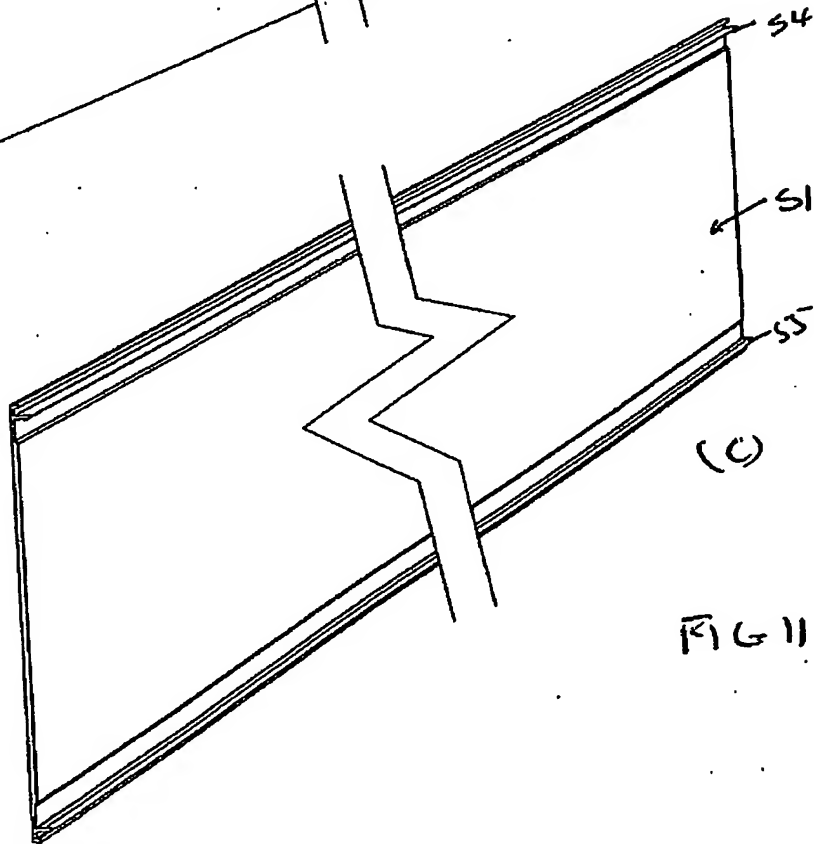
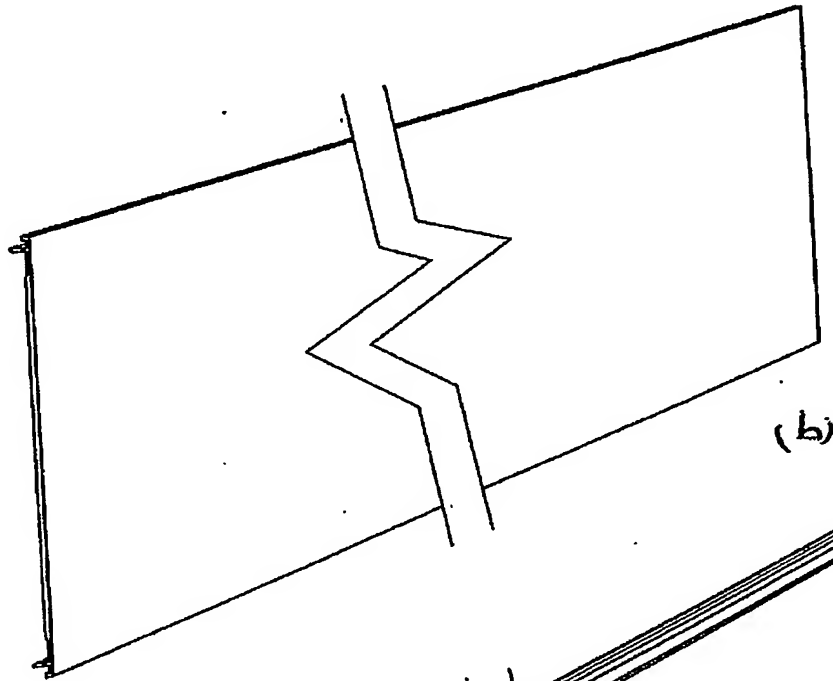
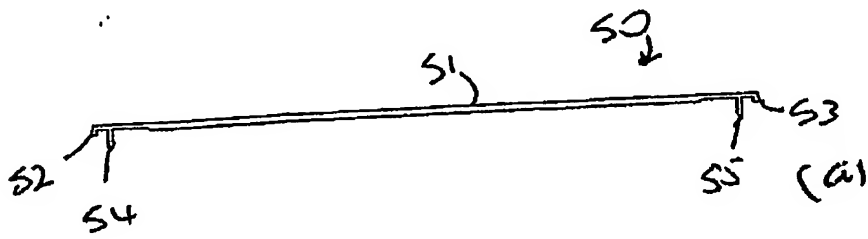


FIG 11

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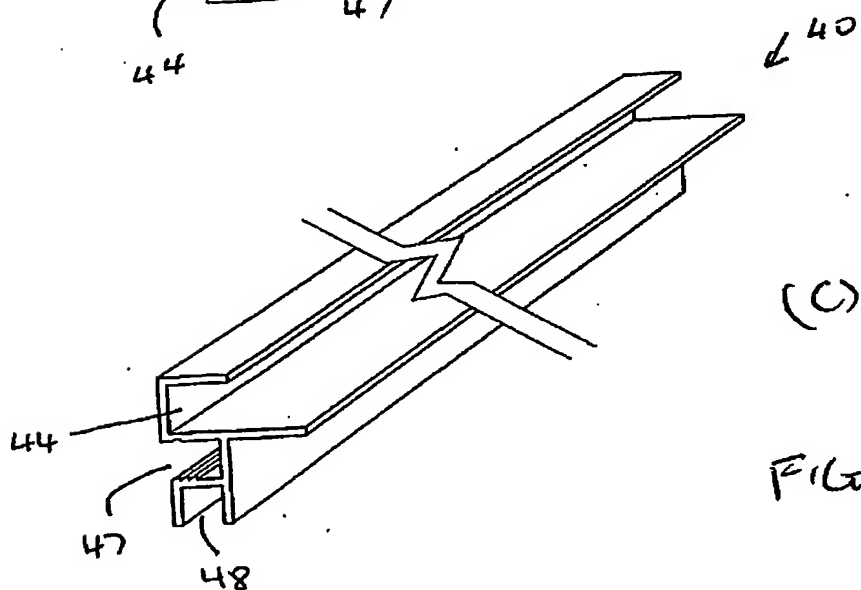
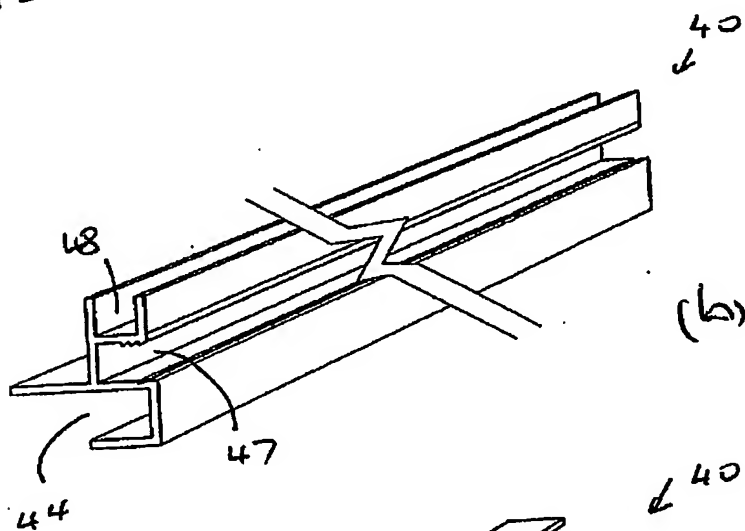
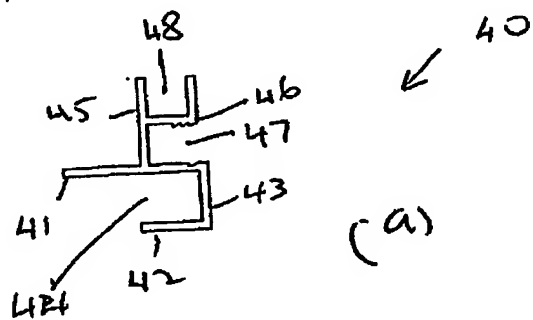


FIG 12

11/12

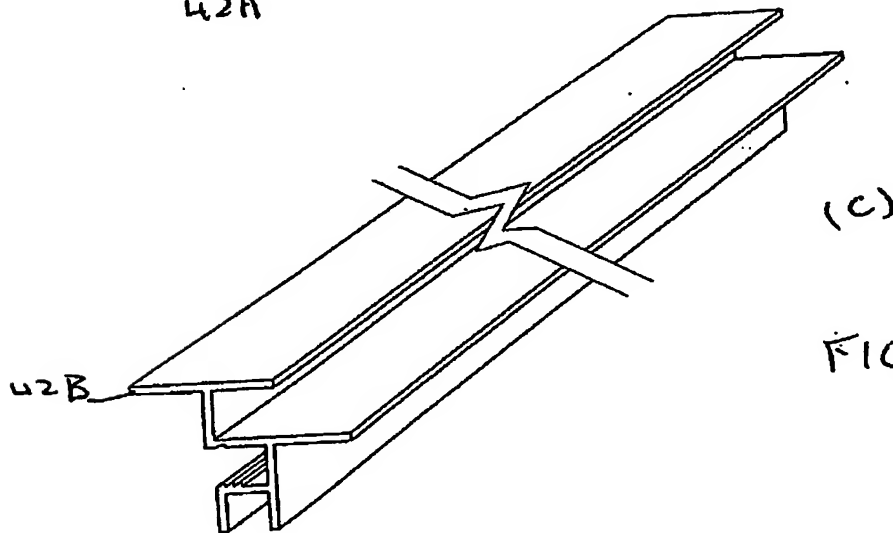
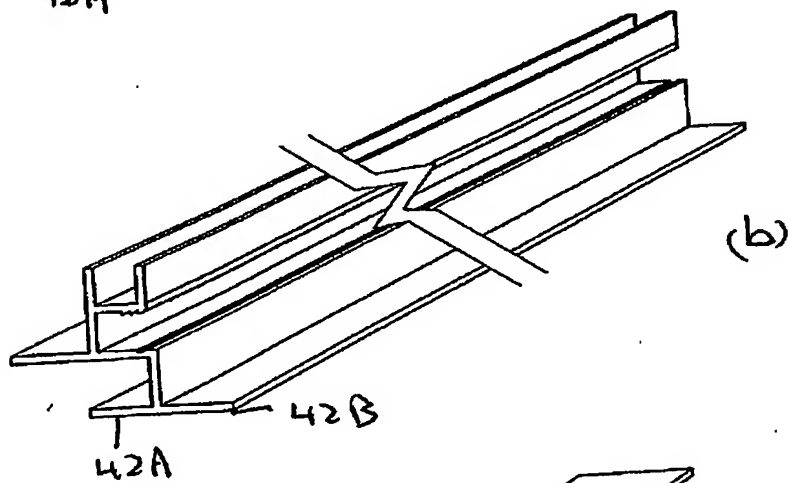
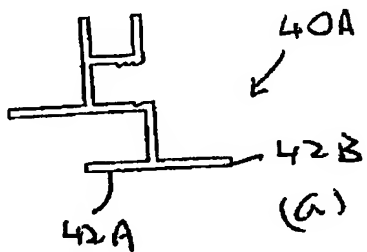
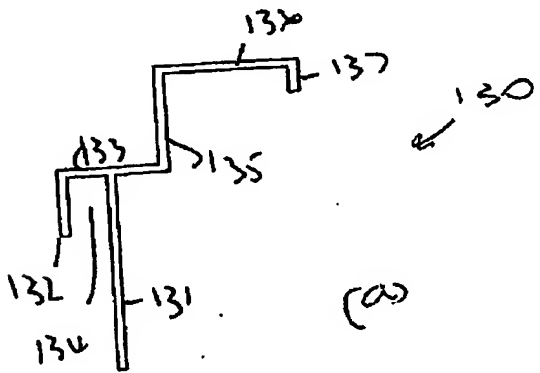
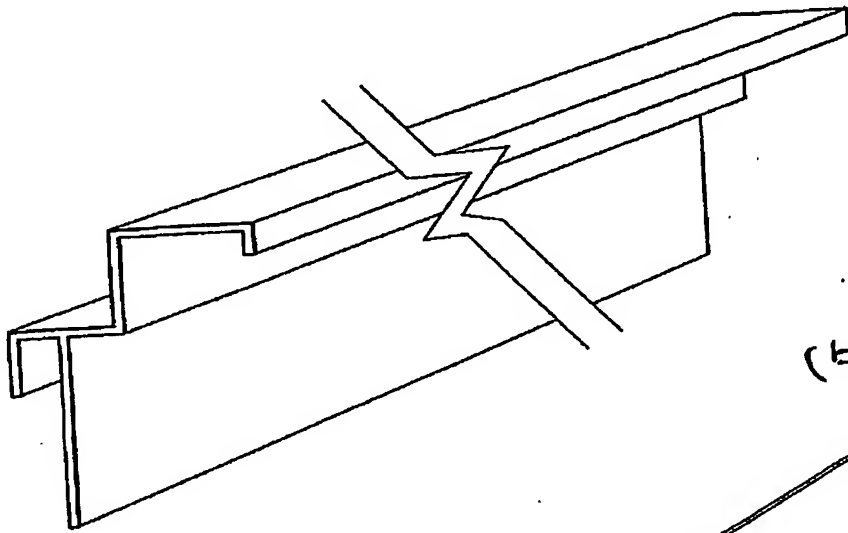


FIG 13

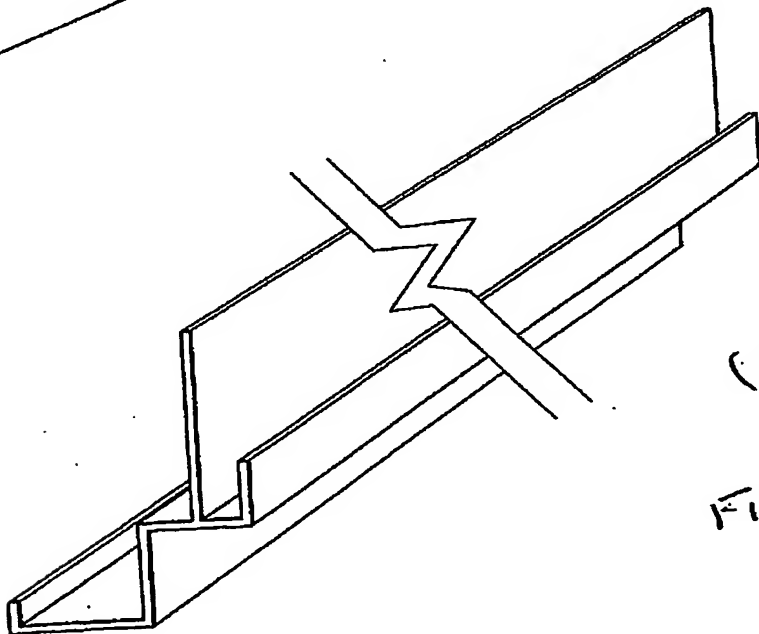
12/12



(a)



(b)



(c)

FIG 14

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